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EFFECT OF IRRIGATION, NITROGEN AND ORGANIC FERTILIZATION ON YIELD AND NUTRIENT CONTENTS OF ZEA MAIZE CROP

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ABSTRACT

A field experiment was carried out at El-Roba village, Baltim, Kafr El- Sheikh Governorate, Egypt during two consecutive growing summer seasons 2004 and 2005 to study the effect of irrigation regimes, organic manure and source and levels of nitrogen fertilizers on zea maize yield and nutrient contents.

The obtained results could be summarized as follows:

The highest values of N concentration in ear leaf (1.89%) in the 1st season as well as P concentration (0.323 and 0.319 %) and K concentration (2.62 and 2.67 %) in both seasons were obtained from zea maize plants irrigated at 1.3 evaporation pan coefficient with applying 10 m^3 chicken manure fed^{-1} and fertilized with enciabeen at 320 kg N $fed.^{-1}$.

The highest values of ear diameter (5.48 cm) and N concentration (1.94 %) in the 2nd season and grain yield (28.69 and 30.1 ardab $fed.^{-1}$) in both seasons were obtained from zea maize plants irrigated at 1.3 evaporation pan coefficient, fertilized with 10 m^3 chicken manure $fed.^{-1}$ and fertilized with urea at 160 kg N $fed.^{-1}$.

The highest values of ear diameter (4.5cm) in the 1st season and 100-grain weight (32.91 and 33.3 g) in the 1st and 2nd seasons were obtained from zea maize plants irrigated at 1.3 evaporation pan coefficient, fertilized with 10 m^3 chicken manure $fed.^{-1}$ and fertilized with urea at 240 kg N $fed.^{-1}$.

From these results, it could be concluded that the application of irrigation water at 1.3 evaporation pan coefficient could be recommended with zea maize for high production under North Delta conditions.

Keywords: Irrigation, N fertilization, organic fertilization, nutrient contents and zea maize.

INTRODUCTION

Water is very important for life in both the biochemical and biophysical synthesis and its influences are both internal and environmental. Water is often the primary limiting factor for maize production. The idea of applying too much water in irrigation to achieve maximum crop yield is not always correct, where, it causes losses of water and fertilizers through leaching. Nitrogen fertilization increased maize yield, this increase may reflect the high response of maize plants to nitrogen fertilizers and consequently improvement of plant growth parameters. Application of organic manure improved soil organic matter contents and soil physical and chemical properties through providing the soil with macro and micronutrients as well as improving soil structure, Othman-Sanaa *et al.* (2005). Zea maize is one of the most important cereal crops in Egypt for human consumption and animal feeding.

Grain yield, 100-grain weight and ear diameter of zea maize were increased with increasing available soil moisture (Karam *et al.*, 2002; Abdel-Mawly and Zanouny, 2005 and Nofal-Fatma *et al.*, 2005)**.** Omran (2005) indicated that increment of grain yield of zea maize might be attributed to positive effect of more available moisture at grain filling which increase the starch contents and organic compounds in maize plants. El-Nagar (2003) indicated that increasing soil moisture increases the mobility of N, P and K, where, the rate of solubility and extent of N, P and K migration increased with increasing soil moisture content.

Applying 10 m^3 $fed.^{-1}$ of chicken manure or rice straw compost increased maize grain yield compared the control treatment (without organic manure). This increment may be attributed to the improving action of organic matter on the physical and chemical properties of soil. (Nofal-Fatma *et al.*, 2005). Also, organic manure contains microorganisms which fix in and release phytohormones, which stimulate plant growth, N, P and K contents. (Othman-Sanaa *et al.*, 2005).

Grain yield, 100-grain weight and NPK content of zea maize was gradually increased with increasing nitrogen fertilization levels from 0 up to 160 kg N $fed.^{-1}$ urea in both seasons. (Nofal-Fatma and Mobarak, 2003 and Nofal-Fatma *et al.*, 2005).

Therefore, this investigation aimed to study the effect of irrigation regimes, organic manure and source and levels of nitrogen fertilizers on zea maize yield and nutrient contents of it.

MATERIALS AND METHODS

Experimental treatments :

The experimental design was split-split-split plot, where the two sources of nitrogen fertilizers (urea and enciabeen -slow release fertilizer-) were assigned in the main-plots, three irrigation regimes (1.3, 1.0 and 0.7 evaporation pan coefficient) were situated in the sub-plots, the organic manure was assigned in the sub-sub plots (chicken manure at 10 m^3 $fed.^{-1}$, compost at 10 m^3 $fed.^{-1}$and non O.M.) and the five N fertilizer levels (0, 80, 160, 240 and 320 kg N fed.-1) were situated in the sub-sub-sub plots. In each of the two seasons, calcium super phosphate (15.5 % P_2O_5) was applied at the rate of 200 kg $fed.^{-1}$ in the last season to tomato crop during the field preparation, while potassium sulphate (48 % K_2O) was applied at the rate of 100 kg $fed.^{-1}$ 6 weeks after tomato transplanting. The mechanical and chemical analyses of experimental soil in both seasons are given in Table 1. The chemical analyses of chicken manure and rice straw compost are shown in Table 2.

The chemical analysis of the irrigation water is given in Table 3.

Every experimental unit area was 40 m^2 (8 x 5 m), which contained seven ridges of 8 m length and 70 cm width. Zea maiz seeds were planted in hills of 30 cm apart.

Plant samples: five ear leaves of zea maize per experimental unit were taken and dried at 70^o C, ground and digested using wet ashing method by a mixture concentrated H_2SO_4 + $HClO_4$ (10:1) according to Chpman and Pratt

(1961) to determine ear leaf content of nitrogen, phosphorus and potassium. N concentration was determined using modified micro – kjeldahl method (Page *et al.*, 1984).

Phosphorus was calorimetrically determined by Murphy and Riley (1962).

Potassium was determined using flamphotometer (Jackson, 1973).

Irrigation treatments:

Potential evapotranspiration by evaporation class A Pan was used. Prevailing weather data of the previous three years of Seedy Salem, Kafr El-Sheikh Governorate were used to estimate the potential evapotranspiration as daily average during the growing seasons of zea maize plants. Irrigation was applied according to the daily record of the evaporation pan and the crop was irrigated when the water balance reached zero. Application of irrigation regime treatments started after life watering.

Table 1: Mechanical and chemical analyses of soil during both seasons of experimentation:

Season	Physical properties				Chemical properties (soil paste)									
	Sand	Silt	Clay	Texture	EC dSm^{-1}	pH	Soluble cations ($meq\ L^{-1}$)				Soluble anions ($meq\ L^{-1}$)			
							Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	SO_4^{--}
2003/ 2004	72	15	13	Sandy loam	1.87	7.8	5.4	2.7	9.1	1.3	--	2.34	7.93	8.23
2004/ 2005	73	14	13	Sandy loam	1.92	7.7	5.8	3.1	8.6	1.7	--	2.53	8.17	8.50

Table 2: Chicken manure and rice straw compost analyses

Property	Rice straw compost		Chicken manure	
	1st year	2nd year	1st year	2nd year
Organic matter	32.71	32.62	58.80	60.00
Moisture content %	25.89	26.1	15.11	15.64
pH	7.43	7.49	8.13	8.21
EC ($dS\ m^{-1}$)	8.12	8.61	4.65	4.78
Total N %	3.93	3.70	3.56	3.76
Total P %	0.91	0.90	2.11	2.23
Total K %	0.63	0.60	1.57	1.38
C/N Ratio	18.6	19.3	15	14

Nitrogen fertilization:

The treatments of enciabeen: Zea maize seeds were planted after tomato plants fertilized with enciabeen to measure the residual effect of slow release nitrogen fertilizer (enciabeen), while, the treatments of urea, zea maize plants fertilized with urea in the same growth.

Table 3: Some characteristics of irrigation water

Cations $meq\ L^{-1}$				Anions $meq\ L^{-1}$				pH	EC dSm^{-1}	TSS	SAR
Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3	HCO^{-}	Cl^{-}	SO_4^{--}				
2.87	4.43	6.7	0.23	---	4.3	4.6	5.23	7.5	1.4	910	3.51

RESULTS AND DISCUSSION

1- Yield and its component:

1-1: Ear diameter:

The data listed in Table 4 reveal that ear diameter of maize was significantly affected by the application of organic manure and N fertilizer levels in both seasons and significantly affected by irrigation regimes and the source of N fertilizer in the 2nd season, while, it not significantly affected by irrigation regimes and the source of nitrogen fertilizer in the 1st season. The highest values of ear diameter as affected by irrigation regimes (4.25 and 4.24 cm) resulted from zea maize plants irrigated at 1.3 ETp in the 1st and 2nd seasons, respectively. This increase can be attributed to the significant role of available water in affecting ear diameter. These results accordance with those obtained by Nofal-Fatma *et al.* (2005) and Omran (2005).

The highest values of ear diameter as affected by organic manure (4.25 and 4.46 cm) obtained from fertilization with 10 m^3 chicken manure $fed.^{-1}$ in 2004 and 2005 seasons, respectively. Improving ear diameter by applying chicken manure was a reflection to the stimulatory effect of both treatments on vegetative growth and availability nutrients. These results agreed with those of El-Atawy (2007), Nofal-Fatma *et al.* (2005) and Othman-Sanaa *et al.* (2005).

The highest value of ear diameter as affected by the source of N fertilizer in the 1st season (4.22 cm) resulted with enciabeen, while, the highest value in the 2nd season (4.12 cm) obtained with adding urea.

The data listed in Table 4 reveal that ear diameter of maize in the 1st and 2nd seasons increased significantly by increasing nitrogen application. The highest ear diameter in the 1st season (4.3 cm) obtained by adding 240 kg N fed^{-1}, while, the highest ear diameter in the 2nd season (4.34 cm) resulted by adding 160 kg N $fed.^{-1}$ The increase in ear diameter was resulted from the increase in vegetative growth. Similar results were obtained by Nofal-Fatma and Mobarak (2003) and Nofal-Fatma *et al.* (2005).

1-2: 100-grain weight (g):

The data presented in Table 4 indicate that 100-grain weight was not significantly affected by the source of nitrogen fertilizers, significantly affected by irrigation regimes and high significantly affected by organic manure and N fertilizer levels in both seasons. The highest values as affected by irrigation regimes (29.7 and 29.55 g) obtained from irrigation at 1.3 ETp in the 1st and 2nd seasons, respectively. It is evident that prolonging irrigation interval might have decreased soil moisture availability and hence might have reduced metabolites translocation to the developing grains**.**

These results accordance with those obtained by El-Atawy (2007), Mahdi and Yin (2003) and Nofal-Fatma *et al.* (2005).

The highest values as affected by organic manure (29.93and 30.32 g) obtained from adding 10 m^3 chicken manure fed^{-1} in the 1st and 2nd seasons, respectively. The increments of 100-grain weight of maize, due to compost or chicken manure additions, may be attributed to the improving action of its fertilizers on the chemical and physical properties in the soil. The present results agree with those obtained by Hanna and El-Awag (2000) and Nofal-Fatma *et al.* (2005).

Table 4: Effect of irrigation regimes, organic manure, source of N fertilizer and its levels and their interactions on the yield and its components of zea maize in 2004 and 2005 seasons.

Treatment	Grain yield (ard. $fed.^{-1}$)		100-grain weight (g)		Ear diameter (cm)	
	2004	2005	2004	2005	2004	2005
A: Source of N fertilizer:						
1 -Urea	21.62	21.84	28.98	29.34	4.21	4.12
2 -Enciabeen	20.51	20.65	29.43	28.96	4.22	3.80
F. test	*	*	N.S.	N.S.	N.S.	*
B : Irrigation regimes :						
1-1.3 Pan evaporation	22.15	22.31	29.70	29.55	4.25	4.24
2-1.0 Pan evaporation	20.86	21.31	29.21	29.16	4.23	4.10
3-0.7 Pan evaporation	20.19	20.12	28.70	28.74	4.16	3.98
F. test	**	**	*	*	N.S.	*
L.S.D. at 5 %	0.376	0.285	0.371	0.215	--	0.116
C : Organic manure :						
1-Chicken manure	24.04	25.26	29.93	30.32	4.25	4.46
2- Rice straw compost	20.87	24.39	29.72	29.71	4.22	3.90
3-Non organic manure	18.29	18.39	27.95	27.43	4.16	3.85
F. test	**	**	**	**	*	*
L.S.D. at 5 %	1.054	0.746	0.095	0.216	0.026	0.038
D: Nitrogen fertilizer levels:						
1- 0 N (control)	17.76	17.58	27.61	26.95	4.05	3.60
2-80 kg N $fed.^{-1}$	20.17	20.44	28.75	28.30	4.17	4.00
3-160 kg N $fed.^{-1}$	22.20	22.68	29.83	29.70	4.27	4.34
4-240 kg N $fed.^{-1}$	22.62	22.78	30.42	30.63	4.30	4.31
5-320 kg N $fed.^{-1}$	22.58	22.58	29.39	30.18	4.28	4.29
F. test	**	**	**	**	*	*
L.S.D. at 5 %	0.029	0.047	0.268	0.165	0.012	0.016
Sig. Interaction :						
A x B	**	**	**	**	**	**
A x C	**	**	**	**	**	**
A x D	**	**	**	**	**	**
B x C	**	**	**	**	**	**
B x D	**	**	**	**	**	**
C x D	**	**	**	**	**	**
A x B x C x D	**	**	**	**	**	**

These results show that zea maize plants which grown in enciabeen treatments resulted 100-grain weight not significantly difference about urea.This effect may be due to sequestering act of SRNF components formed during its decomposition and which would make soil elements get more available. These results accordance with those obtained by Abbady-Khadra *et al.* (2003) and El-Atawy (2007).

The highest values of 100-grain weight as affected by N fertilizer levels (30.42 and 30.63 g) obtained by fertilization with 240 kg N fed.$^{-1}$ in both seasons. The increase in 100-grain weight might be due to the increase in the assimilation rates of translocated materials to the grains rather than the increase in number of grain per ear.

These results are in harmony with those obtained by El-Atawy (2007), Nofal-Fatma and Mobarak (2003) and Nofal-Fatma *et al.* (2005).

1-3: Grain Yield (ard. fed.$^{-1}$):

The data listed in Table 4 indicate that grain yield of zea maize (ard. fed.$^{-1}$) was high significantly affected by irrigation regimes, organic manure and N fertilizer levels, while, it significantly affected by the source of N fertilizer in both seasons.

The highest values as affected by irrigation regimes (22.12 and 22.31 ard.fed.$^{-1}$) obtained from irrigation at 1.3 ETp in the 1st and 2nd seasons, respectively. This increment of grain yield of zea maize might be attributed to positive effect of more available moisture at grain filling which increase the starch contents and organic compounds in maize plants. These results are supported with those obtained by Karam *et al.* (2002), Mahdi and Yin (2003), Nofal-Fatma *et al.* (2005) and Omran (2005).

The highest values of grain yield as affected by organic manure (24.04 and 25.26 ard.fed.$^{-1}$) in the 1^{s} and 2nd seasons, respectively obtained from fertilization at 10 m^3 chicken manure fed.$^{-1}$. This increment of grain yield due to organic manure additions may be attributed to the improving action of organic matter on the physical and chemical properties of soil**.** These results accordance with those obtained by Hanna and El-Awag (2000), Nofal-Fatma *et al.* (2005) and Othman-Sanaa *et al.* (2005).

The fertilization of maize plants with urea increased grain yield by 5.4 and 5.8 % only in 2004 and 2005 seasons, respectively compared those plants which grown at enciabeen treatments after tomato plants which fertilized in the last seasons at the same rates of N fertilizers. These results reveal that enciabeen (SRNF) had a significant effect on next crops which grown after aforetime essential crops, especially when SRNF are applied at high rates. SRNF may be available regular source for N supply. These results are in harmony with those obtained by Abbady-Khadra *et al.* (2003) and El-Atawy (2007).

Data listed in Table 4 reveal that grain yield of zea maize was high significantly in both two growing seasons. The highest values of grain yield as affected by the N fertilizer levels were (22.62 and 22.78 ard.fed.$^{-1}$) in the 1st and 2nd seasons, respectively, obtained by adding 240 kg N fed.$^{-1}$. These results prove clearly the prominent role of N element for increasing grain yield. The effect of N fertilizer on grain yield is the outcome of its positive effect on grain yield components and plant growth parameters (Table 4). These results may be enhanced by those obtained by El-Nagar (2003); Nofal-Fatma and Mobarak (2003) and Nofal-Fatma *et al.* (2005).

2-Chemical content of zea maize plants:

Data in Table 5 reveal that N, P and K concentration in ear leaf of zea maize plants was significantly affected by irrigation regimes and high significantly affected by organic manure and nitrogen fertilizer levels in both seasons.

The highest values of N, P and K Concentration as affected by irrigation regimes were (1.531 and 1.521 %), (0.264 and 0.262 %) and (2.117 and 2.157 %) obtained from zea maize plants irrigated at 1.3 evaporation pan coefficient in both seasons, respectively. These results accordance with those obtained by El-Nagar (2003).

Table 5 : Effect of irrigation regimes, organic manure, source of N fertilizer and its levels and their interactions on N, P and K concentration % in zea maize leaves in 2004 and 2005 seasons.

Treatments	N %		P %			
	1st season	2nd season	1st season	2nd season	1st season	2nd season
A: Source of N Fertilizer:						
1 :Urea	1.418	1.466	0.247	0.247	2.065	2.088
2-Enciabeen	1.500	1.468	0.266	0.262	2.081	2.086
F. test	*	N.S.	*	*	N.S.	N.S.
B : Irrigation regimes:						
1-1.3 Pan evaporation	1.531	1.521	0.264	0.262	2.117	2.157
2-1.0 Pan evaporation	1.430	1.460	0.258	0.253	2.060	2.088
3-0.7 Pan evaporation	1.415	1.420	0.248	0.248	2.042	2.015
F. test	*	*	*	*	*	*
L.S.D. at 5 %	0.011	0.031	0.005	0.004	0.016	0.053
C : Organic manure :						
1-Chicken manure	1.558	1.587	0.277	0.275	2.291	2.312
2- Rice straw compost	1.536	1.540	0.269	0.265	2.136	2.127
3-Non organic manure	1.281	1.275	0.224	0.224	1.791	1.820
F. test	**	**	**	**	**	**
L.S.D. at 5 %	0.013	0.021	0.005	0.007	0.053	0.094
D: Nitrogen fertilizer levels:						
1- 0 kg N fed.$^{-1}$(control)	1.242	1.250	0.212	0.215	1.558	1.605
2-80 kg N fed.$^{-1}$	1.376	1.380	0.240	0.238	1.918	1.974
3-160 kg N fed.$^{-1}$	1.528	1.554	0.282	0.267	2.225	2.197
4-240 kg N fed.$^{-1}$	1.567	1.576	0.279	0.277	2.318	2.307
5-320 kg N fed.$^{-1}$	1.580	1.578	0.270	0.276	2.350	2.353
F. test	**	**	**	**	**	**
L.S.D. at 5 %	0.007	0.001	0.002	0.001	0.026	0.031
Sig. Interaction :						
A x B	**	**	**	**	**	**
A x C	**	**	**	**	**	**
A x D	**	**	**	**	**	**
B x C	**	**	**	**	**	**
B x D	**	**	**	**	**	**
C x D	**	**	**	**	**	**
A x B x C x D	**	**	**	**	**	**

The highest values (1.558 and 1.587 %) of N, (0.277 and 0.27%) of P and (2.291 and 2.312%) of K as affected by organic manure obtained from fertilization at 10 m^3 chicken manure $fed.^{-1}$ in 2004 and 2005 seasons, respectively. These results indicate the essential role of organic manure for improvement of chemical and physical properties of the soil. Also, organic manure contains microorganisms which fix in and release phytohormones, which stimulate plant growth, N, P and K contents. These results could be enhanced with those obtained by Othman-Sanaa *et al.* (2005).

Data listed in Table 5 prove that N concentration in ear leaf of maize plants which fertilized with enciabeen (SRNF) increased by (5.78 and 0.14 %) and P by (7.69 and 6.07 %) in the 1st and 2nd seasons, respectively, compared fertilization at urea in the same seasons, whereas, K concentration in plants which fertilized with enciabeen increased by 0.77 % in the 1st season, while, fertilization with urea increased K content by 0.01% in the 2nd season. The little increasing of N content in zea maize plants as affected of applying enciabeen compared urea may be due to depletion large amount of N from enciabeen applications by the last crop (tomato plants). But, these increasing of N % may be due to that enciabeen applying may available regular source for N supply, and the leaching from enciabeen was less than urea. These results supported with those obtained by Abbady-Khadra *et al.* (2003) and El-Atawy (2007).

The highest values of N concentration (1.580 and 1.578 %) and (2.35 and 2.353 %) of K in ear leaf as affected by N fertilizer levels in the 1st and 2nd seasons, respectively obtained from plants fertilized at 320 kg N $fed.^{-1}$, while, the highest value of P concentration in the 1st season (0.282 %) obtained from fertilization at 160 kg N $fed.^{-1}$, and it was (0.278 %) in the 2nd season, resulted from fertilization at 240 kg N $fed.^{-1}$. The increment of NPK concentration in ear leaf may be due to higher availability of the nutrients with increase in the N fertilizer levels which final resulted in better root growth and increased physiological activity of roots to absorb the nutrients. These results are in accordance with those obtained by El-Atawy (2007) and Othman-Sanaa *et al.* (2005).

CONCLUSION

From these results, it could be concluded that the application of irrigation water at 1.3 evaporation pan coefficient could be recommended with zea maize for high production under North Delta conditions. Addition of organic manure to the soils is an important practice in improving soil properties and productivity. Application of slow-release nitrogen fertilizers in sandy soils may available regular source for nitrogen supply and decreases leaching of nitrogen less than urea.

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تأثير الري و التسميد النيتروجيني و العضوي على المحصول ومحتوى العناصر في محصول الذرة الشامية

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أجريت تجربة حقلية بقرية الربع - بلطيم - محافظة كفر الشيخ .خلال موسمي الزراعة صيفي 2004 و 2005 , لدراسة تأثير مستويات الري (1.3 , 1, 0.7 من معامل وعاء البخر) والتسميد العضوي (سماد دواجن - كمبوست قش أرز - بدون سماد عضوي) ومصدرين للسماد النيتروجيني (اليوريا و الانسيابين - سماد بطئ الذوبان) ومستويات الإضافة لكل منهما (صفر - 80 - 160 - 240 - 320 كجم ن للفدان) على محصول الذرة الشامية . وكانت أهم النتائج كما يلي :

أعلى القيم لمتوسطات جميع الصفات المدروسة في موسمي الزراعة (قطرالكوز- سم- وزن 100 حبة - جرام- إجمالي محصول الحبوب - أردب للفدان- تركيز النيتروجين و الفوسفور و البوتاسيوم في أوراق كوز نباتات الذرة الشامية) تحقق من نباتات تم ريها عند مستوى 1.3 من معامل بخر الوعاء .

أعطت نبات الذرة الشامية التي زرعت بعد محصول الطماطم الذي تم تسميده عضوياً بسماد الدواجن بمعدل 10م^3 للفدان أعلى القيم لمتوسطات جميع الصفات المدروسة .

واختلفت النتائج في مصدر السماد النيتروجيني حيث أعطى أعلى تركيز للنيتروجين في أوراق الكوز (1.89 %) في الموسم الأول و أعلى القيم لتركيز الفوسفور (0.323 و0.319 %) و البوتاسيوم (2.62 و 2.67 %) في الموسم الأول والثاني على التوالي نتجت من نباتات سمدت بسماد الإنسيابين بمعدل 320كجم ن ف$^{-1}$.

أعلى قيمة لقطرالكوز(5,48 سم) و تركيز النيتروجين في أوراق الكوز(1،94 %) في الموسم الثاني وكذلك أعلى القيم لإجمالي محصول الحبوب(28.69 و 30.1 أردب للفدان) في كلا الموسمين 2004و2005علي التوالي نتجت من نباتات سمدت بسماد اليوريا بمعدل 160 كجم ن ف$^{-1}$ بينما كانت أعلى القيم لقطر الكوز(4,5سم) في الموسم الأول و أعلى القيم لمتوسط وزن المائة حبة (32.91 و 33.3 جم) في موسمي الزراعة 2004و2005، على الترتيب.نتجت من نباتات سمدت بسماد اليوريا بمعدل 240 كجم ن ف$^{-1}$.

من هذه النتائج يمكن أن نوصي بأنه للحصول على أعلى محصول من الذرة الشامية يمكن تنظيم ري المحصول في منطقة شمال الدلتا بكفر الشيخ عند مستوى 1,3 من معامل وعاء البخر والتسميد بسماد الدواجن بمعدل 10م^3 للفدان مع التسميد المعدني (اليوريا) بمعدل 160 كجم نيتروجين للفدان .